VALUE RELEVANT ASSET MEASUREMENT AND ASSET USE: EVIDENCE FROM INTERNATIONAL ACCOUNTING STANDARD 41

by

Adrienna Alys Huffman

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STATEMENT OF DISSERTATION APPROVAL

The dissertation of **Adrienna Alys Huffman**

has been approved by the following supervisory committee members:

Christine A. Botosan	, Chair	**5/22/2014** Date Approved
Melissa Lewis	, Member	**5/22/2014** Date Approved
Marlene Plumlee	, Member	**5/22/2014** Date Approved
James Schallheim	, Member	**5/22/2014** Date Approved
Haimanti Bhattacharya	, Member	**5/22/2014** Date Approved

and by **William Hesterly**, Associate Dean of **David Eccles School of Business**

and by David B. Kieda, Dean of The Graduate School.

ABSTRACT

This dissertation is the first to empirically test an asset measurement framework that links asset measurement to asset use. Specifically, I examine whether fair value applied to in-exchange assets and historical cost applied to in-use assets (i.e. measurement consistent with asset use) produces incrementally more value relevant information than when historical cost is applied to in-exchange assets and fair value is applied to in-use assets (i.e. measurement inconsistent with asset use). I test the framework on a sample of 182 international firms from 33 different countries that adopt International Accounting Standard (IAS) 41. IAS 41 prescribes fair value measurement for biological assets, a class of assets previously classified as property, plant, and equipment and measured at historical cost. I find that book value and earnings information is more value relevant when measurement is consistent with asset use as compared to when asset measurement is not linked to asset use. At present, the Conceptual Framework provides little guidance on asset measurement and when certain measurement bases should be used, resulting in inconsistencies across measurement standards. My findings provide evidence supporting a framework for asset measurement, which links asset measurement to asset use. These findings should be of interest to standard setters' and others interested in conceptually based asset measurement.

To my parents, Boyd and Carlotta, without whom none of this would be possible. Thank you for your unending love and support; you are truly my biggest fans.

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CHAPTER 1

INTRODUCTION

Assets generate value via two mechanisms. In-exchange assets (e.g. cash) generate value on a standalone basis in exchange for cash or other valuable assets, while in-use assets (e.g. property, plant, and equipment (hereafter, PP&E)) generate value in combination with other assets. Early accounting theorists link value relevant asset measurement to the manner in which an asset generates value (e.g. Littleton 1935). Specifically, this literature claims that fair value applied to in-exchange assets and historical cost applied to in-use assets has the potential to produce incrementally more value relevant information for investors. Nevertheless, in some cases, modern accounting standards do not link asset measurement to the manner in which the asset generates value. For example, International Accounting Standard (hereafter, IAS) 41 requires fair value measurement for “biological assets,” which are living plants and animals, regardless of whether the biological assets derive value in-use or in-exchange.

I use the adoption of IAS 41 as a setting to examine whether asset measurement linked to asset use provides investors with incrementally more value relevant information. The adoption of IAS 41 offers an advantageous setting to examine the implication of linking asset measurement to asset use on the value relevance of accounting information, for several reasons.

First, the extent to which assets derive value in-use or in-exchange varies across firms for similar types of biological assets. For example, some firms own cattle for meat production (an in-exchange asset) while other firms own cattle for dairy production (an in-use asset). Second, the standard provides variation in asset measurement. Prior to IAS 41, firms measured their biological assets at historical cost and classified them as PP&E. Upon adoption of the standard, some firms began measuring their biological assets at fair value while others applied the historical cost stipulation, discussed further in Chapter 3. Therefore, IAS 41 provides a setting where some firms measure their biological assets in a manner consistent with their use (i.e. historical cost for in-use assets or fair value for in-exchange assets) while others do not (i.e. historical cost for in-exchange assets or fair value for in-use assets). In addition, before adoption of the standard, some firms measure their biological assets consistent with their use (i.e. historical cost for in-use assets) and then upon adoption of the standard, they do not (i.e. fair value for in-use assets). These combinations allow for a cross-sectional and a pre- and postadoption comparison of biological asset-groups where the asset measurement is consistent with the assets' use, versus when it is not for both fair value and historical cost accounting.

Third, for the firms that report their biological assets at fair value, IAS 41 is a "true" fair value standard: the fair value of biological assets is reported on the firm's balance sheet, and any change in the fair value of the biological assets over the reporting period is recognized in periodic income as an unrealized gain or loss. This mitigates issues related to investors' perceptions of recognized versus disclosed amounts when firms fair value nonfinancial assets in disclosures (e.g. Beaver and Landsman 1983;

Ahmed et al. 2006), at discretion (e.g. Easton et al. 1993; Barth and Clinch 1998; Aboody et al. 1999), or when provided a choice (Cairns et al. 2011; Christensen and Nikolaev 2013).

I employ a sample of 182 international firms from 33 countries that adopt IAS 41. In a multipronged approach, I assess the value relevance of book value and earnings information in regressions of stock price, stock returns, future operating cash flows, and future operating income. I separate my sample into two subsamples. The first "consistent measurement" subsample includes observations for which the measurement of biological assets is consistent with their use (i.e. where in-exchange biological assets are measured at fair value and in-use biological assets are measured at historical cost). The second "inconsistent measurement" subsample includes observations for which the measurement of biological assets is inconsistent with their use (i.e. where in-exchange biological assets are measured at historical cost and in-use assets are measured at fair value).

My results are as follows. First, in the cross-sectional tests, I find strong support for my hypothesis, that when measurement is linked to asset use, investors are provided with more value relevant information. As suggested by early accounting theorists, I find that book value and earnings information is more value relevant when asset measurement is consistent with the manner in which the asset realizes value for the firm, relative to when it is not. Specifically, I find that book value and earnings information is more value relevant when in-exchange (in-use) assets are measured at fair value (historical cost) as compared to when in-exchange (in-use) assets are measured at historical cost (fair value).

I supplement my cross-sectional findings by comparing the value relevance of firms' book value and earnings information for firms that switched measurement from historical cost to fair value upon adoption of IAS 41, the "switcher" sample. The results provide mixed evidence. Specifically, I find strong evidence that book value per share became significantly more (less) value relevant for firms that held in-exchange (in-use) biological assets and began measuring them at fair value upon adoption of the standard. However, I find no other statistically significant results in the return tests or the mechanical forecasting models of future operating cash flows and operating income. In future work, I plan to hand-collect the interim fiscal year IAS 41 disclosures in order to increase my sample, and consequently, the power of the switcher test.

Overall, my findings provide some empirical support for early accounting theory that links value relevant asset measurement to the way in which the asset generates value (e.g. Littleton 1935; May 1936). Further, my findings support the International Accounting Standards Board's (hereafter, IASB) recent proposed revisions to the measurement section of its Conceptual Framework. Specifically, the IASB (2013a, ¶6.16) proposes that the relevance and selection of a particular measurement basis depends on how the asset contributes to the entity's future cash flows, i.e. is used by the firm, and this occurs either directly (i.e. in-exchange) or in combination with other assets (i.e. in-use).

This paper makes several contributions to the literature. First, to my knowledge, it is the first to test and provide empirical support for an asset measurement framework that links asset measurement to asset use. This should be of interest to accounting standard setters since the Financial Accounting Standards Board (hereafter, FASB) and the IASB have voiced concern over their lack of a systematic framework to guide asset measurement standards.[1] As a result, asset measurement guidance continues to be a hotly contested standard setting issue and inconsistencies exist across standards.[2] Thus, a framework to guide standard setters' asset measurement choices and to support high-quality, consistent standard setting is greatly needed. I believe my findings provide evidence supporting a systematic framework for asset measurement that could inform standard setters' decision-making processes on future asset measurement standards.

Second, my findings provide evidence that the asset measurement investors find useful in assessing firm value is sometimes, but not always, fair value, and similarly for historical cost. This is in contrast to the current academic debate over asset measurement, which tends to side with either fair value or historical cost. Instead, my findings support the IASB's (2013a, ¶6.14) view on measurement bases which states, "… the IASB's preliminary view is the *Conceptual Framework* should not recommend measuring all assets and liabilities on the same basis." By understanding which asset measurement investors find useful in determining firm value, the accounting community is better positioned to understand cost-benefit tradeoffs and how to improve the effectiveness of financial statement disclosures, a primary objective of the FASB's disclosure framework project (FASB 2012).

Finally, much of the prior literature examining fair value measurement investigates whether fair value is sufficiently reliable to be value relevant to investors,

[1] For example, the opening paragraph of the measurement section from the IASB's (2013a, ¶6.1) discussion paper of its conceptual framework states: "The existing *Conceptual Framework* provides little guidance on measurement and when particular measurement should be used."
[2] The objective of the IASB and FASB's joint project on an improved conceptual framework for financial reporting is "…for their standards to be clearly based on consistent principles. To be consistent, principles must be rooted in fundamental concepts rather than a collection of conventions" (as quoted in Milburn 2012; from IASB 2008, ¶4).

beyond measurement at historical cost.[3] This relative reliability perspective differs from a business valuation perspective, which links value relevant asset measurement to the manner in which the asset realizes value, not to the relative reliability of the measure. In contrast to the relative reliability research, I find that fair value information is more value relevant for in-exchange biological assets than in-use biological assets, even after controlling for cross-sectional differences in measurement reliability. That is, in my study, value relevance is a function of asset use, not the reliability of the fair value measure.[4] I seek to supplement and contribute to the extant literature by providing evidence regarding the link between value relevant asset measurement and the manner in which assets realize value.

[3] See, for example, among others: Easton et al. 1993; Barth 1994a,b; Bernard et al. 1995; Barth et al. 1996; Barth and Clinch 1998; Aboody et al. 1999; Song et al. 2010.

[4] The fair value of both in-exchange and in-use biological assets is often measured using a discounted cash flow approach, considered a "Level 3" estimation as defined by Statement of Financial Accounting Standard (SFAS) 157 (FASB 2006). Research suggests that investors perceive Level 3 estimates as less reliable than "Level 1" or "Level 2" estimates of fair value, which employ market prices (e.g. Kolev 2009; Song et al. 2010).

CHAPTER 2

LITERATURE REVIEW

2.1 Asset Measurement Frameworks

Prior research identifies standard setters' lack of a systematic framework to guide asset measurement standards as a weakness of the Conceptual Framework (see Agarwal 1987; Barth 2007; Barth 2014). The IASB explicitly acknowledges its lack of a framework to guide asset measurement standards in the opening paragraph of the measurement section of the IASB's (2013a, ¶6.13) recent proposed revisions to its Conceptual Framework, which states: "The existing *Conceptual Framework* provides little guidance on measurement and when a particular measurement basis should be used." As a result, inconsistencies exist across asset measurement standards. For example, under United States Generally Accepted Accounting Principles (hereafter, U.S. GAAP) investment property is recognized at cost, while under IFRS, investment property can be recognized at fair value (KPMG 2012). Similarly, under IFRS, PP&E can be recognized at cost, but biological assets, which were formerly classified as PP&E and measured at cost, are required to be recognized at fair value (KPMG 2012). As Cooper (2007, 17) states, the lack of a measurement framework has resulted in, "… a large number of different measurement bases applied in different standards, often with little underlying logic."[5] Further, Barth (2014) argues that the Conceptual Framework's lack of measurement concepts is a major impediment to improving financial reporting.

A potential framework to guide asset measurement appears in early accounting literature. Specifically, early accounting theorists link asset measurement to asset use (see Littleton 1935; May 1936). In this literature, assets derive value either in-exchange or in-use. Assets that derive value in-exchange do so on a standalone basis, independent of other firm assets. The value of such assets to the firm is market driven with no incremental value created by using the asset in combination with other assets. Examples of in-exchange assets include financial securities or a tractor being held for sale. On the other hand, assets that derive value in-use do so in combination with other firm assets such that they create value incremental to the sum of the individual assets' exchange values. Examples of in-use assets include PP&E that is used for productive purposes. Specifically, this literature argues that fair value applied to in-exchange assets and historical cost applied to in-use assets has the potential to provide investors with incrementally more value relevant information to forecast firm value (e.g. Littleton 1935).

Indeed, some modern-day accounting standards require different measurement bases depending upon the firm's use of the asset. For example, Statement of Financial Accounting Standard (SFAS) 144 requires firms to recognize PP&E at the lower of its carrying amount or fair value less costs to sell if the assets are being held for sale (FASB 2010). Otherwise, PP&E is recognized at cost on the balance sheet. Although some

[5] In a similar sentiment, Barth (2014, 1) writes that as a result of the Conceptual Framework's lack of a measurement framework, "…standard setting measurement decisions have been necessarily *ad hoc* and based more on historical precedent and the combined judgment of individual FASB and IASB members derived from experience, expertise, and intuition than on agreed upon measurement concepts."

financial accounting standards link measurement to asset use, consistent with early accounting theory, this approach has not been adopted at the Conceptual Framework level. Further, there has been no empirical evidence on whether linking measurement to asset use provides investors with more value relevant information. This paper provides an empirical test of the theory.

In contrast to early accounting theory, advocates of fair value accounting propose fair value as *the* value relevant measurement basis for both in-exchange and in-use assets, as long as the fair value can be reliably estimated. Specifically, this research argues that if fair value can be captured using quoted market prices, a Level 1 estimate from the fair value measurement hierarchy defined by SFAS 157 (FASB 2006), it will provide investors with value relevant information (e.g. Barth and Landsman 1995; Dietrich et al. 2000; Barth et al. 2001; Landsman 2007). Generally, fair value advocates argue that fair value information is more relevant to investors than historical cost information for both in-exchange and in-use assets (e.g. Barth et al. 2001; Landsman 2007).

2.2 Research on Fair Value Accounting

Consistent with both early accounting theory and fair value advocates, prior empirical research has repeatedly established the value relevance of fair value measurement for a specific class of in-exchange assets: financial securities.[6] Moreover, these findings extend to investors' use of fair value measurement information for financial securities under all three levels of the fair value measurement hierarchy defined by SFAS 157: quoted prices for identical assets (Level 1), quoted prices of similar assets

[6] These studies consistently find that investors perceive fair value estimates for financial securities as more value relevant than historical cost amounts: Barth 1994a, b; Ahmed and Takeda 1995; Bernard et al. 1995; Petroni and Whalen 1995; Barth et al. 1996; Eccher et al. 1996; Nelson 1996.

(Level 2), and fair value measured using valuation techniques (Level 3) (Kolev 2009; Song et al. 2010). Consistent with these findings, recent research finds no difference in the value relevance of Level 1 versus Level 3 inputs for financial securities (Lawrence et al. 2014), and that Level 3 inputs best capture the underlying cash flows generated from financial securities when markets are inactive (Altamuro and Zhang 2013). Accordingly, the value relevance of fair value information is not simply a function of measurement reliability.

The empirical research on the relevance of fair value for financial securities provides the strongest evidence in favor of fair value as *the* value relevant measurement basis. Financial securities, however, derive value in-exchange, not in-use. Therefore, the fair value research on financial securities does not distinguish between the two asset measurement frameworks, early accounting theory versus fair value advocates: there is little variation in the manner in which financial securities are expected to realize value for the firm. Moreover, whether fair value provides investors with value relevant information for in-exchange assets that are not financial securities is an empirical question that I test in this paper.

Empirical research regarding equity investors' use of fair value measurement for nonfinancial assets provides mixed findings. First, the studies do not clarify whether the nonfinancial assets derive value in-use or in-exchange. Second, the research examining the value relevance of fair value for nonfinancial assets is burdened by the lack of mandated measurement variation across in-use asset classes. Accordingly, early research examining investors' use of fair value information for in-use assets examines *disclosed* current cost estimates for firms' PP&E required under SFAS 33. Collectively, this research fails to find that current cost disclosures are value relevant (e.g. Beaver and Landsman 1983; Beaver and Ryan 1985; Bernard and Ruland 1987; Hopwood and Schaefer 1989; Lobo and Song 1989). The lack of relevance, however, could be attributed to investors' perceptions of disclosed values as less reliable or relevant than recognized amounts (see Ahmed et al. 2006).

Later empirical research examining investors' use of fair value measurement for nonfinancial assets employs settings in which United Kingdom (hereafter, U.K.) and Australian firms made *discretionary* revaluations to their tangible long-lived assets. Generally, this research provides evidence that investors find the asset revaluations value relevant in stock price and return estimations (e.g. Easton et al. 1993; Barth and Clinch 1998) and in mechanical forecasting models of future operating cash flows and operating income (Aboody et al. 1999). However, a problem drawing inferences from the discretionary asset revaluation research is that managers decide to revalue ex-post and therefore may revalue for a host of reasons that are unrelated to providing investors with value relevant information, i.e. when they need to manage reported performance (Christensen and Nikolaev 2013). Again, the studies do not clarify whether the nonfinancial assets in question derive value in-use or in-exchange.

More recent empirical research on fair value measurement of nonfinancial assets examines firms' measurement *choice* for nonfinancial assets upon adoption of IFRS. Both Cairns et al. (2011) and Christensen and Nikolaev (2013) find that few U.K., Australian, and German firms choose to measure their nonfinancial assets at fair value upon adoption of IFRS. Instead, Christensen and Nikolaev (2013) find that firms almost exclusively choose historical cost measurement for intangibles and PP&E asset classes (i.e. in-use assets).

Some research attributes the mixed evidence on the relevance of fair value measurement for nonfinancial assets to the lack of reliability of the fair value estimates (e.g. Barth et al. 2001). Instead, I argue that prior research has not carefully considered the role asset use might play in determining which asset measurement basis is value relevant. Thus, the mixed results could be linked to the confounding factor of asset use as opposed to variation in the reliability of the estimates. I empirically test whether fair value or historical cost measurement for in-use assets provides investors with more value relevant information on a sample of firms that adopt IAS 41.

2.3 Research on Historical Cost Accounting

Unlike the research on fair value accounting for nonfinancial assets, there is little empirical research on the value relevance of historical cost for in-use assets. Most of the literature arguing that historical cost may provide investors with value relevant information for in-use assets relies on business valuation theory, including Littleton (1935) and May (1936). Specifically, this literature focuses on the information investors require to forecast the cash flows in-use assets generate. For example, Deans (2007, 31) argues, "…it is harder to see how knowing the fair values (exit values) of [in-use] assets that generate cash flows helps in forecasting those cash flows." Cooper (2007, 17) argues that while historical cost may not be relevant when making an economic decision with respect to a specific asset, for example deciding whether to sell an asset, not all decisions are made on an asset-by-asset basis. Instead, Cooper (2007) argues that for in-use assets, assets that are used in combination with other assets in a business venture and where immediate sale is not intended, historical cost best captures the overall profitability of the business venture.

In addition, Nissim and Penman (2008) maintain that historical cost accounting is designed for business models where the firm transforms inputs to add value, i.e. in-use assets. Similarly, a measurement framework developed by the Institute of Chartered Accountants in England and Wales (2010) advocates for historical cost accounting as the most relevant measurement basis when the firm's business model is to transform inputs so as to create new assets or services as outputs, i.e. in-use assets. Additionally, Botosan and Huffman (2014) argue that historical cost provides investors with relevant information for in-use assets because historical cost information is useful to investors in forecasting the future cash flows from in-use assets. Finally, the IASB (2013a, ¶6.16b) states that for assets deriving value in-use, investors may find historical cost more relevant than fair value because historical cost preserves the margins generated by past transaction that investors find useful in estimating future margins to forecast the cash flows in-use assets generate. The IASB (2013a, ¶6.16b) states, "Changes in the market price of [in-use assets]… may not be particularly relevant for this purpose."

Whether asset measurement linked to asset use provides investors with value relevant information is an empirical question I test in this paper. In particular, whether fair value measurement provides investors with value relevant information for in-exchange assets that are not financial securities, and whether fair value or historical cost measurement provides investors with value relevant information for in-use assets remain open empirical questions in the literature. I examine early accounting theory's proposal that measurement linked to asset use provides investors with value relevant information on a sample of firms that adopt IAS 41.

CHAPTER 3

MOTIVATION AND HYPOTHESES

3.1 IAS 41 Background

The International Accounting Standards Committee, the IASB's predecessor, issued IAS 41 in 2001 in order to develop more uniform accounting practices for agricultural activities (IASB 2006). The standard became effective for annual reporting periods beginning on or after January 1, 2003, or alternatively, upon adoption of IFRS. IAS 41 prescribes accounting treatment for biological assets, which are living plants and animals.[7] Biological assets are held by firms involved in agricultural activity. Agricultural activities that produce or employ biological assets include raising livestock, forestry, cropping, cultivating orchards and plantations, floriculture, and aquaculture (IASB 2009, ¶6).

Prior to the passage of IAS 41, agricultural activity was excluded from the scope of international accounting standards (IASB 2012, ¶8). Accounting guidelines for agricultural activities were developed by national standard setters on a piecemeal basis to resolve specific issues (IASB 2012, ¶8b). Pre-IAS 41, most firms accounted for their biological assets at historical cost and classified the assets as PP&E on the balance sheet.

[7] Specifically, IAS 41 prescribes accounting treatment for agricultural activity, or "management by the entity of the biological transformation of living animals and plants (biological assets) for sale, into agricultural produce, or into additional biological assets" (IASB 2009, ¶IN1).

Consequently, the assets were subject to impairment analysis. Upon adoption of the standard, however, firms line item the value of their biological assets on the balance sheet, separate from PP&E.

The passage of IAS 41 offers a unique setting to test whether asset measurement linked to asset use provides investors with value relevant information, for several reasons. First, variation exists in the manner in which firms employ their biological assets to realize value. Specifically, IAS 41 encourages firms to distinguish between "consumable" and "bearer" biological assets in order to provide information that may help investors to assess the timing of future cash flows (IASB 2009, ¶43). This distinction maps closely into the way in which the biological assets are expected to realize value for the firm. Consumable biological assets are agricultural products, like crops or timber, or sold as biological assets, like commodities (IASB 2009, ¶44). Consumable biological assets realize value on a standalone basis and their value to the firm is linked to what the asset might be exchanged for in the marketplace. Thus, these assets are closer in nature to in-exchange assets. Bearer biological assets, on the other hand, are self-regenerating assets, like orchards or oil palm plantations (IASB 2009, ¶44), which are employed in combination with other assets in the on-going operations of the firm. Thus, bearer biological assets realize value in combination with other assets and are therefore closer in nature to in-use assets. I employ IAS 41's definition of consumable and bearer biological assets to proxy for the assets' value realization, either in-exchange or in-use, respectively.

Second, IAS 41 provides a setting with mandated measurement variation. Prior to adoption of IAS 41, firms measured their biological assets at historical cost and classified them as PP&E. IAS 41 requires firms to measure their biological assets at fair value, although the standard allows firms to measure their biological assets at historical cost if the firm is able to demonstrate that the fair value of its biological assets cannot be reliably estimated, i.e. there is a lack of reliable parameters such as known prices, growth rates, or physical volumes of the asset (IASB 2009, ¶30). I utilize this measurement variation in my research design. Specifically, 41% (789 observations) of the firm-year observations in my sample contain biological assets measured at cost, while 41% of the firm-year observations contain biological assets measured at fair value (see Figure 3.1). Of the cost sample, 237 observations are post-IAS 41 firm-year observations where firms applied the historical cost stipulation. The measurement variation in the sample of firms that apply the historical cost stipulation postadoption of IAS 41 appears to be driven at the country level. Specifically, it appears that certain countries are enforcing IAS 41 as mandated, like the United Kingdom, while other countries are allowing firms to apply the historical cost stipulation within the standard. I include country fixed-effects in my estimations to control for this variation, and I also explore the effects of audit enforcement of accounting standards in robustness tests.

Finally, IAS 41 is a “true” fair value standard. That is, the firms that measure their biological assets at fair value must recognize the value on their balance sheets and any change in the value of the assets over the reporting period, unrealized gains or losses, in income. Therefore, IAS 41 provides variation in asset measurement while helping to mitigate issues related to investors’ perceptions of recognized versus disclosed amounts when firms fair value in-use assets in disclosures (e.g. Beaver and Landsman 1983; Ahmed et al. 2006), or when provided a choice (Cairns et al. 2011; Christensen and Nikolaev 2013).

Under IAS 41, a firm producing palm oil from oil palm trees measures its oil palm plantations, an in-use asset, at fair value on the balance sheet, excluding any fair value attributable to the land upon which the oil palms are physically attached or intangible assets related to the oil palm production (IASB 2009, ¶2). Thus, firms are required to measure and report only the oil palm trees component of the in-use assets, not the land or intangible assets related to the production of the palm oil, at fair value. Likewise, a firm that harvests logs from timber plantations, an in-exchange asset, also measures the timber plantations at fair value every reporting period on the balance sheet, less any costs to sell. Changes in the fair value of the oil palm plantations or timber (i.e. unrealized holding gains and losses) are recognized in periodic income (IASB 2009).

Unlike IFRS, the term “biological assets” does not exist in U.S. GAAP or in its accounting for agricultural producers (KPMG 2012). Instead, the terms “growing crops” and “animals being developed for sale” are used to describe what would be called biological assets under IFRS (KPMG 2012). Under U.S. GAAP, growing crops and animals being developed for sale can be stated at the lower of cost or market, or at sales price less costs to sell if the following criteria are met: the product has a determinable market price, insignificant costs of disposal, and is available for immediate delivery (KPMG 2012). It is interesting to note that assets with these characteristics are closer in nature to in-exchange assets and when a sufficiently reliable measure of fair value exists, U.S. GAAP allows such assets to be reported at fair value determined based on exit value less cost to sell.

Recently, the Asian-Oceanian Standard Setters Group (AOSSG) proposed different accounting treatments for bearer and consumable biological assets because of the differences in the way the asset-types are used by the firm (IASB 2012). Specifically, the AOSSG Issues Paper (IASB 2012) argues that bearer biological assets are held for income generation (derive value in-use) and therefore should be treated as PP&E, which allows for measurement at cost, while consumable biological assets are held for sale (derive value in-exchange), and as such should continue to be measured at fair value. Moreover, the paper surveys a group of analysts specializing in plantation valuations, a type of bearer biological asset. The paper reports that the analysts did not find the reporting of the fair value of bearer biological assets as useful because the fair value, "…distorts the financial statements' ability to reflect a 'true & fair' view of an agriculture company's earnings" (IASB 2012, ¶32a). Further, the analysts said that, "… they always remove the biological gains or losses [from bearer biological assets] when looking at earnings and that end-users also do not look at fair value" (IASB 2012, ¶33).

In response to the AOSSG Issues Paper (IASB 2012), the IASB recently issued an Exposure Draft (IASB 2013b) proposing to amend IAS 41 with respect to a specific class of bearer biological assets: bearer plants.[8] Consistent with the framework I test in this paper, the Exposure Draft (IASB 2013b, ¶BC2) asserts that bearer plants are similar to PP&E, and as such, should be accounted for under IAS 16, the standard that prescribes measurement for PP&E, and allows for measurement at historical cost. The Exposure Draft (IASB 2013b, ¶BC5) argues that investors, analysts, and other users of financial statements did not find the fair values of bearer plants useful and would adjust reported statements to eliminate the effects of the fair value accounting. Further, the Exposure Draft (IASB 2013b) does not propose disclosing fair value amounts for bearer plants.

Nevertheless, under IAS 41, firms measure both in-exchange and in-use

[8] The proposed amendment to IAS 41 does not include bearer livestock, like dairy cattle, only plants.

biological assets at fair value, and at historical cost. This allows for cross-sectional tests of comparison of firm-year observations where measurement is consistent with asset use (the consistent measurement sample), i.e. where in-exchange biological assets are measured at fair value and in-use biological assets are measured at historical cost, and firm-year observations where measurement is inconsistent with asset use (the inconsistent measurement sample), i.e. where in-exchange biological assets are measured at historical cost and in-use biological assets are measured at fair value.

3.2 Main Hypothesis

I examine whether asset measurement linked to asset use provides investors with relatively more value relevant information to assess firm value than asset measurement that is not linked to asset use. In their joint Conceptual Framework for financial reporting, the FASB and the IASB characterize financial information as decision-useful if it is relevant and faithfully represents what it purports to represent (IASB 2010, ¶QC4). Relevant information, as characterized by the Conceptual Framework, is financial information that is capable of making a difference in the decisions made by users, i.e. it has predictive or confirmatory value, or both (IASB 2010, ¶QC6-¶QC7). I adopt this characterization of value relevant financial reporting information in my empirical tests, and I focus on the value relevance of financial reporting information to investors.[9]

Consequently, my main hypothesis examines the *relative* value relevance of

[9] I recognize that the information needs of some users of financial reporting information are driven by economic decisions that are not informed by an assessment of firm value. I focus on the information needs of users interested in assessing firm value because a rigorous consideration of the information needs of all users is impractical. Moreover, I believe the users I focus on comprise an important set. This is supported by Dichev et al. (2012), who find that 94.7% of the public company CFOs they surveyed identify valuation as the primary reason earnings are important to users.

firm's financial statement information when biological assets are measured consistent with their use, relative to when they are not:

> *H1: Asset measurement consistent with biological assets' use provides investors with more value relevant information than measurement that is inconsistent with the biological assets' use.*

		Measurement		
		FV	**HC**	**TOTAL**
Value Realization	**IN-USE**	343	607	950
		25%	*45%*	*70%*
	IN-EXCH	216	182	398
		16%	*14%*	*30%*
	TOTAL	559	789	1,348
		41%	*59%*	*100%*

Figure 3.1
Value Realization and Measurement Sample Composition for the Cross-Sectional Sample

CHAPTER 4

RESEARCH DESIGN

I adopt a multipronged approach to test my hypothesis. I first employ cross-sectional tests, where I examine value relevance regressions of stock price and returns, and mechanical forecasting models of operating cash flows and operating income for the sample of firms that measure their biological assets consistent with their use compared to the sample of firms that measure their biological assets inconsistent with the assets' use. I estimate the cross-sectional tests on firm-year observations pre-IAS 41, where firms measured their biological assets at historical cost and classified them as PP&E, and on firm-year observations post-IAS 41 adoption.

I include pre-IAS 41 observations in my cross-sectional tests for two reasons. First, pre-IAS 41, measurement at historical cost was not a choice: all firms measured their biological assets at historical cost, as part of PP&E. This avoids the potential selection bias of including only post-IAS 41 historical cost observations, where firms apply the historical cost stipulation to measure their biological assets at historical cost instead of fair value. Second, including the pre-IAS 41 data allows for a larger sample of historical cost observations: 789 observations (see Figure 3.1) versus 237 observations if I only include the post-IAS 41 sample. This increases the power of my tests and therefore, the potential inference to be made regarding value relevant asset measurement and asset use.

Next, I examine the value relevance of book value and earnings information for the "switcher" sample, the sample of firms that pre-IAS 41 measured their biological assets at historical cost and then switched measurement to fair value upon adoption of the standard. Figure 4.1 illustrates the approach. As described earlier, prior to IAS 41, firms measured their biological assets at historical cost and classified them as PP&E. Therefore, the adoption of IAS 41 provides a setting where firms that held in-exchange biological assets measured them inconsistent with their use pre-adoption, but then switched measurement to fair value consistent with the biological asset's use. Similarly, in the pre-adoption period, some firms measured their in-use assets consistent with their use (at historical cost) and then postadoption, began measurement of their in-use assets inconsistent with their use (measured at fair value). I again estimate value relevance regressions of stock price and returns, and mechanical forecasting models of operating cash flows and operating income for the switcher sample. I limit my sample to firm-year observations with at least one year of pre-IAS 41 data.

In both my cross-sectional and switcher tests, I include no more than five years of pre-IAS 41 data for the following reason. I assume that the type of biological assets the firm held upon adoption of IAS 41, either in-use or in-exchange, are the type of biological assets that the firm held in the prior five years since these data are unobservable in the pre-IAS 41 period. If one assumes that a firm's business model is stable over more than five years, this is a conservative assumption in that it excludes observations, which might otherwise be valid. Nevertheless, this assumption allows me to better ensure that my inferences with respect to the pre-IAS 41 data are driven by the value relevance of the biological assets, not other unrelated asset or business choices the firm might have made in a preperiod of greater length than five years.[10] Further, several of the firms in my sample have close to 20 years of pre-IAS 41 data. By restricting the pre-IAS 41 data to five years, I can better ensure that one firm's data or a limited sample of firms are not driving my results.

4.1 Consistent and Inconsistent Measurement Samples

I sort firm-year observations into the consistent and inconsistent measurement samples in the following manner. I employ IAS 41's definition of consumable and bearer biological assets to represent in-exchange and in-use biological assets, respectively. To be classified as consistent, I group firm-year observations where in-exchange biological assets are measured at fair value (216 firm-year observations) or in-use biological assets are measured at historical cost (607 firm-year observations) (see Figure 3.1). To be classified as inconsistent, I group firm-year observations where in-use biological assets are measured at fair value (343 firm-year observations) or in-exchange biological assets are measured at historical cost (182 firm-year observations) (see Figure 3.1). Recall that for the pre-IAS 41 historical cost data, I assume that the type of biological assets the firm held in the year it adopted IAS 41, either in-use or in-exchange, is the type of biological assets the firm held in the pre-adoption period.

My sample is limited to firm-year observations drawn from firms for which all of their biological assets are measured on a consistent or inconsistent basis. Mixed measurement firms are those which measure some biological assets on a consistent basis

[10] My results are unchanged if I include fewer than five years of pre-IAS 41 data.

and some on an inconsistent basis. I exclude firm-year observations from such mixed measurement firms (270 firm-year observations). I do so to ensure clear predictions regarding my measurement samples. This provides a sample of 823 firm-year observations for the consistent measurement sample and 525 firm-year observations for the inconsistent measurement sample.

4.2 Interpretation of the Results

For the cross-sectional tests, I estimate all models on the pooled sample and then separately by measurement basis. I evaluate results in the following manner. If value relevant asset measurement is linked to asset use, then I expect the variables for the consistent sample, in the stock price and return models and the mechanical forecasting models of operating cash flows and operating income, to be incrementally more significant than the variables for the inconsistent sample. Specifically, the evidence would suggest that firm inputs are relatively more predictive of firm performance when measurement is consistent with asset use (the consistent sample), relative to when it is not (the inconsistent sample).

In the switcher sample design, I expect that postadoption of IAS 41, the value relevance of firms' book value and earnings information will significantly improve for the sample of firms that held in-exchange biological assets and began measuring them at fair value upon adoption of the standard. On the other hand, I expect that postadoption of IAS 41, the value relevance of firms' book value and earnings information will significantly decline for the sample of firms that held in-use biological assets and upon adoption of IAS 41 measured the assets at fair value. This would provide evidence in support of my hypothesis, that measurement linked to asset use provides investors with relatively more value relevant information than asset measurement that is not linked to asset use.

4.3 Price and Return Tests

I follow prior value relevance research and examine value relevance regressions of price and returns. In a vein similar to Easton et al. (1993), Barth and Clinch (1998), and Aboody et al. (1999), I estimate the following cross-sectional model on the pooled sample and then by measurement basis:

$$P_{i,t} = \mu_0 + \mu_1 CON + \mu_2 BVPS_{i,t} + \mu_3 EPS_{i,t} + \mu_4 CON * BVPS_{i,t} + \varepsilon_t \quad (4.1)$$

In model (4.1), $P_{i,t}$ is the share price for firm *i* one month following the annual report filing or, alternatively, four months following the end of the firm's fiscal year-end; CON is a dummy variable that takes the value of one for firm-year observations classified in the consistent measurement sample; $BVPS_{i,t}$ is the firm's book value per share at the end of the fiscal year; and $EPS_{i,t}$ is earnings per share at fiscal year-end excluding any unrealized gains or losses (URGL) related to the fair value of the biological assets recognized in income. I include the URGL related to the fair value of the biological assets in the BVPS term because this is the variable I interact with CON in testing my hypothesis. I include the interaction term to examine whether firms' book value is incrementally more value relevant when biological assets are measured consistent with their use, i.e. the consistent measurement sample, relative to when they are not, i.e. the inconsistent sample.

I then estimate a variation of model (4.1) for the switcher sample:

$$P_{i,t} = \mu_0 + \mu_1 CHG\_CON + \mu_2 POST + \mu_3 BVPS_{i,t} + \mu_4 EPS_{i,t}$$
$$+ \mu_5 CHG\_CON * BVPS_{i,t} + \mu_6 POST * BVPS_{i,t}$$
$$+ \mu_7 CHG\_CON * POST * BVPS_{i,t} + \varepsilon_t \quad (4.2)$$

In model (4.2), POST is an indicator variable that takes a value of one if the firm-year observation falls in the post-IAS 41 period and CHG_CON is an indicator variable that takes a value of one if the firm holds in-exchange biological assets. All other variables are defined above. In model (4.2), the variables of interest are: μ_5 which captures the value relevance of BVPS pre-IAS 41 for firms that held in-exchange biological assets and measured them at cost; μ_6 which captures the value relevance of BVPS post-IAS 41 for firms that held in-use biological assets and measured them at fair value; and finally, μ_7 which captures the value relevance of BVPS post-IAS 41 for firms that held in-exchange biological assets and measured them at fair value. If my hypothesis is supported, I expect μ_7 to be significantly positive, and I expect μ_5 and μ_6 to be significantly negative. These findings would suggest that firms' BVPS significantly increased in value relevance once firms' that held in-exchange biological assets began measuring them at fair value (μ_7), compared to when firms measured their in-exchange biological assets at historical cost pre-IAS 41 (μ_5), and firms that held in-use biological assets and began measuring them at fair value postadoption of IAS 41 experienced a decline in the value relevance of their BVPS (μ_6).

I also include the changes estimation of model (4.1), following Easton et al. (1993), Barth and Clinch (1998), and Aboody et al. (1999). Specifically, I estimate the following cross-sectional model on the pooled sample and then by measurement basis:

$$Ret_{i,t} = \mu_0 + \mu_1 CON + \mu_2 NI_{i,t} + \mu_3 \Delta NI_{i,t} + \mu_4 CON * NI_{i,t} + \varepsilon_t \quad (4.3)$$

In model (4.3), $Ret_{i,t}$ is the firm *i*'s cumulative 12-month raw return ending the month following the annual report filing or, alternatively, four months following the end of the firm's fiscal year-end; $NI_{i,t}$ is the firm's net income for the fiscal year; and $\Delta NI_{i,t}$ is the change in net income over the fiscal year. I include the interaction term to examine whether net income is incrementally more value relevant for firm returns when measurement is consistent with asset use. All variables are deflated by beginning period market value of equity.

Finally, I estimate a variation of model (4.3) for the switcher sample:

$$Ret_{i,t} = \mu_0 + \mu_1 CHG\_CON + \mu_2 POST + \mu_3 NI_{i,t} + \mu_4 \Delta NI_{i,t} + \mu_5 CHG\_CON * NI_{i,t}$$
$$+ \mu_6 POST * NI_{i,t} + \mu_7 CHG\_CON * POST * NI_{i,t} + \varepsilon_t \quad (4.4)$$

All variables are defined above. In model (4.4), the variables of interest are: μ_5 which captures the value relevance of firms' NI pre-IAS 41 for firms that held in-exchange biological assets and measured them at cost; μ_6 which captures the value relevance of firms' NI post-IAS 41 for firms that held in-use biological assets and measured them at fair value; and finally μ_7 which captures the value relevance of firms' NI post-IAS 41 for firms that held in-exchange biological assets and measured them at fair value. If my hypothesis is supported, I expect μ_7 to be significantly positive, and I expect μ_5 and μ_6 to be significantly negative. These findings would suggest that firms' NI significantly increased in value relevance once firms that held in-exchange biological assets began measuring them at fair value (μ_7), compared to when firms measured their in-exchange biological assets at historical cost pre-IAS 41 (μ_5), and firms that held in-use biological assets and began measuring them at fair value postadoption of IAS 41 experienced a decline in the value relevance of their NI (μ_6).

I estimate standard errors clustered by firm for models (4.1)-(4.4) and I winsorize the price and return samples at the second and 98th percentiles to minimize the influence of outliers. In addition, I include country and year fixed effects in all estimations in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

4.4 Mechanical Forecast Models

I examine whether asset measurement linked to asset use influences the ability of a mechanical forecasting model of firms' future operating cash flows and operating income. I follow prior international accounting research to estimate forecasts of both operating cash flows and income (e.g. Barth et al. 2012). The operating cash flows model for the cross-sectional test appears below, which I estimate on the pooled sample and then by measurement basis:

$$CF_{i,t+1} = \alpha + \mu_1 CON + \mu_2 CF_{i,t} + \mu_3 NI_{i,t} + \mu_4 CON * NI_{i,t} + \varepsilon_{i,t} \quad (4.5)$$

where net operating cash flows for firm i , CF_{t+1}, one period ahead of fiscal year *t* are a function of: operating cash flows for fiscal year *t*, $CF_{i,t}$; and $NI_{i,t}$ net income for fiscal year *t*. In addition to future operating cash flows, I estimate model (4.5), including the sum of future operating cash flows one, two, and three periods ahead of fiscal year *t*, as the dependent variable. I include the interaction term to examine whether net income is incrementally more predictive of future operating cash flows when measurement is consistent with asset use. All variables are deflated by average total assets.

I estimate a variation of model (4.5) for the switcher sample:

$$CF_{i,t+1} = \mu_0 + \mu_1 CHG\_CON + \mu_2 POST + \mu_3 CF_{i,t} + \mu_4 NI_{i,t} + \mu_5 CHG\_CON * NI_{i,t} + \mu_6 POST * NI_{i,t} + \mu_7 CHG\_CON * POST * NI_{i,t} + \varepsilon_t \quad (4.6)$$

All variables are defined above. In addition to future operating cash flows, I estimate model (4.6), including the sum of future operating cash flows one, two, and three periods ahead of fiscal year *t*, as the dependent variable. In model (4.6), the variables of interest are: μ_5 which captures the value relevance of firms' NI pre-IAS 41 for firms that held in-exchange biological assets and measured them at cost; μ_6 which captures the value relevance of firms' NI post-IAS 41 for firms that held in-use biological assets and measured them at fair value; and finally μ_7 which captures the value relevance of firms' NI post-IAS 41 for firms that held in-exchange biological assets and measured them at fair value. If my hypothesis is supported, I expect μ_7 to be significantly positive, and I expect μ_5 and μ_6 to be significantly negative. These findings would suggest that firms' NI significantly increased in value relevance once firms' that held in-exchange biological assets began measuring them at fair value (μ_7), compared to when firms measured their in-exchange biological assets at historical cost pre-IAS 41 (μ_5), and firms that held in-use biological assets and began measuring them at fair value postadoption of IAS 41 experienced a decline in the value relevance of their NI (μ_6).

The operating income model I estimate for the cross-sectional test appears below, which I estimate on the pooled sample and then by measurement basis:

$$OP\_INC_{i,t+1} = \alpha + \mu_1 CON + \mu_2 OP\_INC_{i,t} + \mu_3 OP\_INC_{i,t-1} + \mu_4 CON * OP\_INC_{i,t} + \varepsilon_{i,t} \quad (4.7)$$

where operating income for firm *i*, $Op\_INC_{i,t+1}$, one period ahead of fiscal year *t* is a function of: the current period's operating income, $Op\_INC_{i,t}$; and lagged operating income, $Op\_INC_{i,t-1}$. I calculate operating income using the *S&P Capital IQ* variable "earnings from continuing operations," which includes unrealized gains and losses related to biological assets. Again, I include the interaction term to examine whether operating income is incrementally more predictive of future operating income when measurement is consistent with asset use.

I estimate a variation of model (4.7) for the switcher sample:

$$OP_{INC_{i,t+1}} = \mu_0 + \mu_1 CHG\_CON + \mu_2 POST + \mu_3 OP_{INC_{i,t}} + \mu_4 OP_{INC_{i,t-1}} + \mu_5 CHG\_CON * OP_{INC_{i,t}} + \mu_6 POST * OP_{INC_{i,t}} + \mu_7 CHG\_CON * POST * OP_{INC_{i,t}} + \varepsilon_t \quad (4.8)$$

All variables are defined above. In model (4.8), the variables of interest are: μ_5 which captures the value relevance of firms' OP_INC pre-IAS 41 for firms that held in-exchange biological assets and measured them at cost; μ_6 which captures the value relevance of firms' OP_INC post-IAS 41 for firms that held in-use biological assets and measured them at fair value; and finally μ_7 which captures the value relevance of firms' OP_INC post-IAS 41 for firms that held in-exchange biological assets and measured them at fair value. If my hypothesis is supported, I expect μ_7 to be significantly positive, and I expect μ_5 and μ_6 to be significantly negative. These findings would suggest that firms' OP_INC significantly increased in value relevance once firms that held in-exchange biological assets began measuring them at fair value (μ_7), compared to when firms measured their in-exchange biological assets at historical cost pre-IAS 41 (μ_5), and firms that held in-use biological assets and began measuring them at fair value postadoption of IAS 41 experienced a decline in the value relevance of their OP_INC (μ_6).

All variables in models (4.5)-(4.8) are deflated by average total assets and are winsorized at the second and 98th percentiles to minimize the influence of outliers. I estimate all standard errors clustered by firm. In addition, I include country and year fixed effects in all estimations in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

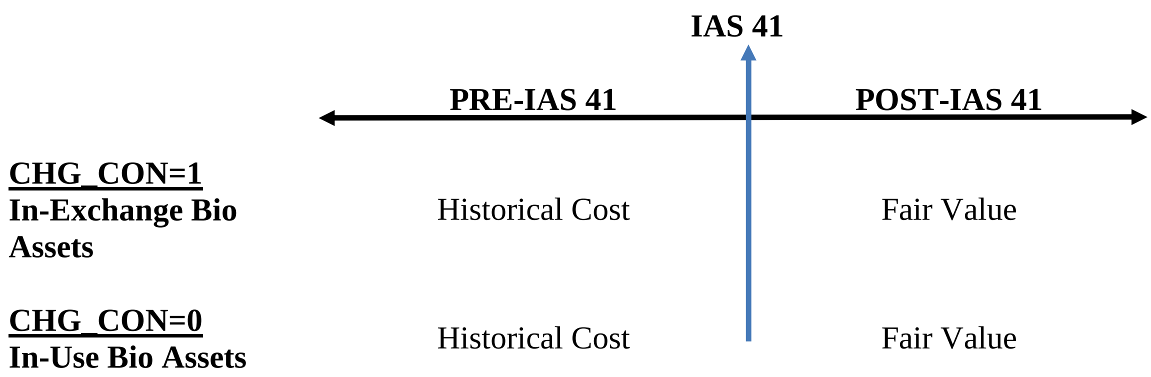

Figure 4.1
Switcher Sample Research Design

CHAPTER 5

SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

5.1 Sample Identification and Data Sources

I identify firms that hold biological assets by conducting a word search in the *Morningstar Document Research* Global Report's subscription and in the *S&P Capital IQ* databases. I search on the phrase "biological assets." I supplement this search with a report issued by the Institute of Charted Accountants of Scotland that lists Australian, U.K., and French firms that hold biological assets (see Elad and Herbohn 2011, Appendix 1). I restrict the *Morningstar* and the *S&P Capital IQ* searches to annual report filings. I then eliminate firms with biological assets that comprise less than 5% of the firm's total assets (433 firm-year observations). I eliminate firm-year observations where book equity is negative (11 firm-year observations). I further eliminate firms that have less than $1 million U.S. Dollars (USD) in total assets, or fewer than five years of financial statement data available on the *S&P Capital IQ* database to eliminate outliers from my estimations that may have undue influence on the results (55 firm-year observations).

I hand-collect the IAS 41 data. Specifically, for each fiscal year in my sample, I hand-collect the following amounts: the balance sheet value of the biological assets; any URGL related to the change in the fair value of the biological assets recognized on the income statement or in the footnote; the classification of the biological assets as consumable or bearer; and whether the firm measures the biological assets at fair value or historical cost. I collect all financial statement data from *S&P Capital IQ* and I collect all price and return data from *Datastream*.

For firms that are cross-listed on different exchanges, I calculate the price and return variables using aggregated market data.[11] Specifically, I sum the market value and the shares outstanding across all cross-listed market exchanges. I then calculate an aggregate firm price by dividing the aggregated market cap by the aggregated shares amount. I calculate an aggregate firm return by value-weighting the monthly returns from all the cross-listed market exchanges by market cap.

I pull all financial statement, price, and return data converted to USD from the respective databases. The hand-collected data, on the other hand, are reported in the filing currency. I convert the hand-collected amounts to USD using the ratio of *S&P Capital IQ*'s total assets reported in the firm's filing currency to *S&P Capital IQ*'s total assets reported for the firm in USD to calculate a historical conversion rate. This way I convert the hand-collected amounts using the same historical conversion rate *S&P Capital IQ* used for the other firm financial statement data. I convert all data to USD for descriptive ease.

5.2 Descriptive Statistics

Figure 5.1 provides the sample composition for the switcher sample by pre- and postadoption periods, and value realization, either in-use or in-exchange. Recall that firms are included in the switcher sample if they have at least one year and no more than

[11] Fifty-five percent of firms in the sample are cross-listed on a variety of other exchanges.

five years of preperiod data. This provides a sample of 154 firms. The majority of the sample holds in-use assets (66%). Further, preperiod data account for 42% of the sample while postadoption data account for 58% of the sample.

Table 5.1 provides descriptive statistics for the composition of the cross-sectional sample by country. The sample is comprised of 182 firms from 33 different countries (see Table 5.1). Approximately 42% of the firms in the sample are located in Australia, Malaysia, or Singapore. Table 5.2 provides descriptive statistics for the composition of the cross-sectional sample by fiscal year and measurement basis. The cross-sectional sample spans 1996-2011 (see Table 5.2). The historical cost observations comprise the early years of the sample while the fair value sample is concentrated in the latter half of the sample period, coinciding with the increased country-level adoption of IFRS. The fair value firm-year observations from 1999-2001 are Australian firms that reported the fair value of their regenerating and self-generating assets under the Australian standard AASB 1037 that predated IAS 41. I include these observations in the sample because they provide variation in value realization and asset measurement.[12]

Table 5.3 provides descriptive statistics for the cross-sectional sample that measures their biological assets at fair value. The descriptive statistics are presented by consistent and inconsistent measurement sample. All data are reported in USD and winsorized at the second and 98th percentiles to reduce the influence of outliers on results. Results from t-statistic tests of differences in means and medians between the consistent and inconsistent samples are reported in the consistent sample tables.

Table 5.3 shows that consistent sample of firms that measure their biological assets at fair value is significantly less profitable, on average and at the median, in terms

[12] My findings are robust to the exclusion of the firm-year observations that pre-date IAS 41.

of operating cash flows ($0.03 versus $0.05), net income ($0.02 versus $0.05), operating income ($0.02 versus $0.05), and future operating income ($0.03 versus $0.06). This finding is possibly related to the difference in firms' business models. Specifically, firms that hold in-exchange assets (the consistent sample) are less profitable than firms that hold in-use assets (the inconsistent sample) because firms with in-use assets take on more risk and therefore require a higher return: in-use assets (bearer biological assets) take longer to produce future revenue than in-exchange assets (consumable biological assets). There is no significant difference at the mean between the consistent and inconsistent samples for the price and return variables. Further, both the consistent and inconsistent samples hold on average 25% of biological assets comprising total assets. In addition, both samples have average price per share of approximately $5.00.

Table 5.4 provides descriptive statistics for the cross-sectional sample that measures their biological assets at historical cost. The descriptive statistics are presented by consistent and inconsistent measurement sample. All data are reported in USD and winsorized at the second and 98^{th} percentiles to reduce the influence of outliers on results. Results from t-statistic tests of differences in means and medians between the consistent and inconsistent samples are reported in the consistent sample tables.

Table 5.4 shows that consistent sample of firms that measure their in-use biological assets at historical cost is significantly larger in terms of observations for the price and return estimations: 440 observations for the consistent sample versus 85 observations for the inconsistent sample. The sample is comprised of few firms that measure their in-exchange biological assets at historical cost. Nevertheless, the consistent sample is more profitable, on average, than the inconsistent sample in terms of EPS

($0.08 versus $0.01), and returns (0.26 versus 0.17). This finding is again consistent with differences in firms' business models. Specifically, firms that hold in-use assets (the consistent sample) are more profitable and have a higher return than firms that hold in-exchange assets (the inconsistent because firms with in-use assets take on more risk and require a higher return: in-use assets (bearer biological assets) take longer to produce future revenue than in-exchange assets (consumable biological assets). There is no significant difference between the two samples with respect to mechanical forecasting model variables.

Table 5.5 provides descriptive statistics for the switcher sample. The descriptive statistics are presented by consistent and inconsistent measurement sample. All data are reported in USD and winsorized at the second and 98th percentiles to reduce the influence of outliers on results. Results from t-statistic tests of differences in means and medians between the consistent and inconsistent samples are reported in the consistent sample tables.

Table 5.5 shows that consistent sample of switcher firms is significantly less profitable than the inconsistent sample of switcher firms. The consistent switcher sample is less profitable, on average, than the inconsistent switcher sample in terms of operating cash flows ($0.01 versus $0.06), net income ($0.01 versus $0.04), future operating cash flows ($0.02 versus $0.06), operating income (-$0.01 versus $0.04), and future operating income (-$0.01 versus $0.05). This finding continues to support my assertion that the difference in profitability is related to the different business models required for in-use versus in-exchange biological assets. Specifically, firms that hold in-exchange assets (the consistent sample) are less profitable than firms that hold in-use assets (the inconsistent sample) because firms with in-use assets take on more risk and therefore require a higher return: in-use assets (bearer biological assets) take longer to produce future revenue than in-exchange assets (consumable bearer biological assets).

	PRE-IAS 41 HC	POST-IAS 41 FV	
IN-USE	222 28%	292 37%	514 66%
IN-EXCH	106 14%	162 21%	268 34%
TOTAL	155 42%	368 58%	782 100%

Figure 5.1
Value Realization and Measurement Sample Composition for the Switcher Sample

Table 5.1
Cross-Sectional Sample Composition by Country

Country	**Firms**	**% of Total**
Australia	23	12.60%
Brazil	9	4.90%
Canada	7	3.80%
Channel Islands	2	1.10%
Chile	4	2.20%
China	3	1.60%
Denmark	1	0.50%
Finland	3	1.60%
Greece	2	1.10%
Hong Kong	9	4.90%
Indonesia	1	0.50%
Jamaica	1	0.50%
Latvia	3	1.60%
Lithuania	1	0.50%
Luxembourg	2	1.10%
Malaysia	41	22.40%
Mauritius	1	0.50%
Mexico	1	0.50%
Netherlands	1	0.50%
New Zealand	7	3.80%
Norway	8	4.40%
Peru	2	1.10%
Philippines	4	2.20%
Portugal	2	1.10%
Singapore	12	6.60%
South Africa	6	3.30%
Spain	1	0.50%
Sri Lanka	9	4.90%
Sweden	3	1.60%
Switzerland	1	0.50%
Turkey	1	0.50%
Ukraine	3	1.60%
United Kingdom	7	3.80%
Zambia	1	0.50%
TOTAL FIRMS	**182**	**100.00%**

Table 5.2
Cross-Sectional Sample Composition by Fiscal Year

FYEAR	HC Observations	FV Observations	Total Observations
1996	2	0	2
1997	5	0	5
1998	17	0	17
1999	29	1	30
2000	36	2	38
2001	44	6	50
2002	56	8	64
2003	72	17	89
2004	74	27	101
2005	75	34	109
2006	77	46	123
2007	76	56	132
2008	75	80	155
2009	60	91	151
2010	51	94	145
2011	40	97	137
TOTAL	**789**	**559**	**1,348**

Table 5.3
Descriptive Statistics for the Fair Value Cross-Sectional Sample

Consistent Sample – In-Exchange Assets at Fair Value

Variable	Obs	Mean	Median	St. Dev.
FV BIO %	141	0.25	0.23*	0.17
MVE	141	1056.01	199.50	2202.66
PRICE	141	5.97	1.36	9.19
EPS	141	0.21*	0.05	0.85
BVPS	141	4.50	1.55	6.54
RETURN	141	0.17	0.00	0.77
CF	216	0.03***	0.04	0.11
NI	216	0.02***	0.04***	0.11
FUT CF	216	0.05	0.05	0.12
LAG OP_INC	216	0.01***	0.03***	0.11
OP_INC	216	0.02***	0.04***	0.11
FUT OP_INC	216	0.03**	0.04***	0.14
SUM FUT CF	179	0.16*	0.18	0.35

Inconsistent Sample – In-Use Assets at Fair Value

Variable	Obs	Mean	Median	St. Dev.
FV BIO %	266	0.25	0.18	0.18
MVE	266	1204.16	166.74	2958.65
PRICE	266	4.96	1.08	7.90
EPS	266	0.33	0.10	0.70
BVPS	266	4.61	1.27	8.26
RETURN	266	0.18	0.08	0.65
CF	343	0.05	0.06	0.08
NI	343	0.05	0.05	0.10
FUT CF	343	0.06	0.06	0.09
LAG OP_INC	343	0.04	0.05	0.10
OP_INC	343	0.05	0.06	0.11
FUT OP_INC	343	0.06	0.06	0.12
SUM FUT CF	274	0.20	0.18	0.27

Table 5.4
Descriptive Statistics for the Historical Cost Cross-Sectional Sample

Consistent Sample – In-Use Assets at Historical Cost

Variable	**Obs**	**Mean**	**Median**	**St. Dev.**
BV BIO %	237	0.21**	0.16**	0.17
MVE	440	533.43*	66.82	1781.98
PRICE	440	1.54	0.39	3.71
EPS	440	0.08**	0.03***	0.23
BVPS	440	1.09**	0.41*	2.32
RETURN	440	0.26**	0.16***	0.69
CF	607	0.06	0.06	0.08
NI	607	0.04	0.04	0.09
FUT CF	607	0.07	0.07	0.10
LAG OP_INC	607	0.03	0.04	0.08
OP_INC	607	0.04	0.04	0.08
FUT OP_INC	607	0.05*	0.05*	0.10
SUM FUT CF	560	0.22	0.23*	0.26

Inconsistent Sample – In-Exchange Assets at Historical Cost

Variable	**Obs**	**Mean**	**Median**	**St. Dev.**
BV BIO %	54	0.27	0.19	0.24
MVE	85	190.53	63.52	278.92
PRICE	85	1.41	0.34	3.20
EPS	85	0.01	0.01	0.33
BVPS	85	1.83	0.53	4.18
RETURN	85	0.17	0.01	0.78
CF	182	0.05	0.05	0.10
NI	182	0.03	0.04	0.10
FUT CF	182	0.06	0.06	0.11
LAG OP_INC	182	0.02	0.03	0.10
OP_INC	182	0.03	0.04	0.10
FUT OP_INC	182	0.03	0.04	0.11
SUM FUT CF	169	0.22	0.20	0.27

Table 5.5
Descriptive Statistics for the Switcher Sample

Consistent Sample – In-Exchange Assets at Fair Value

Variable	Obs	Mean	Median	St. Dev.
FV BIO %	164	0.15	0.10	0.19
MVE	164	887.48	128.54	2075.27
PRICE	164	3.86	0.82	7.11
EPS	164	0.11***	0.03**	0.65
BVPS	164	3.04	0.72**	5.38
RETURN	164	0.12**	-0.01	0.67
CF	268	0.03***	0.05	0.11
NI	268	0.02**	0.04**	0.11
FUT CF	268	0.04**	0.05	0.12
LAG OP_INC	268	0.01***	0.03*	0.11
OP_INC	268	0.02***	0.04**	0.12
FUT OP_INC	268	0.03***	0.04***	0.14
SUM FUT CF	233	0.17*	0.18	0.32

Inconsistent Sample – In-Use Assets at Fair Value

Variable	Obs	Mean	Median	St. Dev.
FV BIO %	359	0.15	0.10	0.17
MVE	359	1013.18	120.60	2585.13
PRICE	359	4.56	0.90	7.47
EPS	359	0.29	0.07	0.64
BVPS	359	4.08	1.13	7.50
RETURN	359	0.27	0.15	0.79
CF	514	0.05	0.06	0.08
NI	514	0.04	0.04	0.09
FUT CF	514	0.06	0.06	0.10
LAG OP_INC	514	0.03	0.04	0.08
OP_INC	514	0.04	0.05	0.09
FUT OP_INC	514	0.05	0.05	0.11
SUM FUT CF	448	0.20	0.21	0.29

CHAPTER 6

RESULTS

6.1 Cross-Sectional Results

6.1.1 Price and Return Results

Table 6.1 presents the results from the cross-sectional price estimation. Column (1) presents the results for the full sample, while columns (2) and (3) present the results for the sample of firms that measure their biological assets at fair value, and the sample of firms that measure their biological assets at historical cost, respectively. All estimations include country and year fixed effects in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

Consistent with prior value relevance research, both book value and earnings per share are significantly, and positively, associated with price in all estimations. Further, the book value per share for the sample of firms that measure their biological assets consistent with their use is significantly more value relevant than the book value of firms that measure their biological assets inconsistent with their use. This result holds for both the fair value and historical cost samples. Specifically, when firms measure their in-exchange biological assets at fair value and their in-use assets at historical cost, their book value is significantly more value relevant than firms that measure their in-use assets at fair value and their in-exchange assets at historical cost (see Table 6.1, columns (1) - (3)). The price results strongly support my first hypothesis, that when firms measure their biological assets consistent with their use, they provide investors with more value relevant information than firms that do not measure their biological assets consistent with their use.

Table 6.2 presents the results from the cross-sectional return estimation. Column (1) presents the results for the full sample, while columns (2) and (3) present the results for the sample of firms that measure their biological assets at fair value, and the sample of firms that measure their biological assets at historical cost, respectively. Again, all estimations include country and year fixed effects in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

The return results for the full sample (see Table 6.2, column (1)) suggest that when firms measure their biological assets consistent with their use, they provide investors with significantly more value relevant net income than firms that do not measure their biological assets consistent with their use. Again, this result holds for both the fair value and historical cost samples (see Table 6.2, columns (2) and (3)). Overall, the return results in Table 6.2 confirm the findings in Table 6.1, that when firms measure their biological assets consistent with their use, they provide investors with significantly more value relevant earnings information in return estimations than firms that do not measure their biological assets consistent with their use.

Both the price and return estimations strongly support my hypothesis, namely that when asset measurement is linked to asset use, firm inputs to price and return estimations are significantly more value relevant than when measurement is not linked to asset use.

6.1.2 Operating Cash Flows and Operating Income Results

Table 6.3 presents the results from the mechanical forecasting model of future operating cash flows. Column (1) presents the results for the full sample, while columns (2) and (3) present the results for the sample of firms that measure their biological assets at fair value, and the sample of firms that measure their biological assets at historical cost, respectively. All estimations include country and year fixed effects in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

The results for the full sample in Table 6.3 (see column (1)) suggest that when measurement is linked to assets' use, firms' net income is significantly more predictive of the next year's operating cash flows. However, the results for the full sample appear to be driven by the fair value sample and not the historical cost sample (see Table 6.3, columns (2) and (3)). Specifically, the results suggest that net income is significantly more predictive of future operating cash flows when in-exchange assets are measured at fair value relative to when in-use assets are measured at fair value (see Table 6.3, column (2)). However, it does not appear that net income is significantly more predictive of future operating cash flows when in-use assets are measured at historical cost relative to when in-exchange assets are measure at historical cost (see Table 6.3, column (3)).

Table 6.4 presents the results from the mechanical forecasting model of the sum of future operating cash flows, one, two and three periods ahead of the current fiscal year.

Column (1) presents the results for the full sample, while columns (2) and (3) present the results for the sample of firms that measure their biological assets at fair value, and the sample of firms that measure their biological assets at historical cost, respectively. All estimations include country and year fixed effects in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

The results in Table 6.4, column (1) demonstrate no difference in the predictability of net income for the sum of future operating cash flows between the consistent and inconsistent samples. Thus, net income is not significantly more predictive for the consistent sample beyond the first year of future operating cash flows. This result holds for both the fair value and historical cost samples (see Table 6.4, columns (2) and (3)). Overall, the results in Table 6.4 suggest that the incremental predictive ability of the consistent sample's net income for future operating cash flows is restricted to the first year of future operating cash flows, not beyond the first year.

Finally, Table 6.5 presents the results from the mechanical forecasting model of future operating income. Column (1) presents the results for the full sample, while columns (2) and (3) present the results for the sample of firms that measure their biological assets at fair value, and the sample of firms that measure their biological assets at historical cost, respectively. All estimations include country and year fixed effects in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

The results in Table 6.5 suggest that when firms measure their biological assets consistent with their use, their operating income is significantly more predictive of their future operating income, relative to firms that do not measure their biological assets consistent with their use. Again, the results hold for both the fair value and historical cost samples. Specifically, when firms measure their in-exchange biological assets at fair value and their in-use assets at historical cost, their operating income is significantly more predictive of their future operating income than firms that measure their in-use assets at fair value and their in-exchange assets at historical cost (see Table 6.5, columns (2) and (3)).

Collectively, the results from the mechanical forecasting models of future operating cash flows and operating income provide strong support for my hypothesis. Specifically, the results suggest that when measurement is consistent with the biological assets' use, net income and operating income are significantly more predictive of future firm performance.

6.2 Switcher Sample Results

6.2.1 Price and Return Results

Table 6.6 presents the results from the switcher sample price estimation. I include country and year fixed effects in the estimation in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

The results support my main hypothesis. Specifically, the results in Table 6.6 suggest that book value per share became significantly more value relevant for the sample of firms that held in-exchange biological assets and began measuring them at fair value upon adoption of IAS 41 (CHG_CON*POST*BVPS). On the other hand, the results in Table 6.6 suggest that book value per share became significantly less value relevant for the sample of firms that held in-use biological assets and began measuring them at fair value upon adoption of IAS 41 (POST*BVPS). Moreover, the results in Table 6.6 also suggest that book value per share was significantly less value relevant when firms measured their in-exchange biological assets at historical cost, pre-adoption of IAS 41 (CHG_CON*BVPS). The price results provide strong support for my main hypothesis that measurement linked to asset use provides investors with significantly more value relevant information.

Table 6.7 presents the results from the switcher sample return estimation. I include country and year fixed effects in the estimation in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country. Overall, I find no statistically significant results, although the signs of the coefficients of interest support my hypothesis. Specifically, the sign on the CHG_CON*POST*NI coefficient in Table 6.7 is positive, while the signs on both CHG_CON*NI and POST*NI are negative,. The coefficients, however, are not statistically different from zero.

Collectively, the price results for the switcher sample support my main hypothesis, while I find no evidence in the return switcher estimation.

6.2.2 Operating Cash Flows and Operating Income Results

Table 6.8 presents the results from the switcher sample mechanical forecasting model of future operating cash flows, while Table 6.9 presents the results from the switcher sample mechanical forecasting model of the sum of future operating cash flows, one, two, and three years following the current fiscal year. I include country and year fixed effects in the estimations in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

Again, I find no significant results. In Table 6.8, the sign on the CHG_CON*POST*NI coefficient is positive while the sign on the CHG_CON*NI coefficient is negative, consistent with my predictions, but the sign on the POST*NI coefficient is positive, opposite my prediction. None of the coefficients are statistically different from zero. Further, none of the coefficients of interest in Table 6.9 have the predicted signs, even though the coefficients are, again, not statistically different from zero.

Finally, Table 6.10 presents the results from the switcher sample mechanical forecasting model of future operating income. I include country and year fixed effects in the estimation in order to control for unobservable, confounding variables that differ across firms, but are constant over time and across country.

Again, I find no significant results. In Table 6.10, the sign on the CHG_CON*POST*OP_INC coefficient is positive, but the signs on the CHG_CON*OP_INC coefficient and the POST* OP_INC coefficient are positive, opposite my predictions. None of the coefficients are statistically different from zero, however.

Overall, I find no support for my hypothesis in the switcher sample tests of future operating cash flows and operating income.

Table 6.1
Cross-Sectional Price Results

VARIABLES	Expectations	(1) FULL PRICE	(2) FV PRICE	(3) HC PRICE
CON		-0.394	-0.775**	-0.358*
		(-1.466)	(-2.093)	(-1.923)
BVPS	+	0.832***	0.749***	0.540*
		(9.070)	(7.748)	(1.891)
EPS	+	0.866***	0.700***	2.973***
		(3.631)	(2.881)	(3.434)
CON*BVPS	+	**0.365*** **	**0.312** **	**0.865*** **
		(3.558)	(1.765)	(3.005)
INTERCEPT		0.141	1.328**	-0.029
		(0.334)	(2.487)	(-0.108)
Observations		932	407	525
R-squared		0.863	0.890	0.822
Country FE		Y	Y	Y
Year FE		Y	Y	Y

Table 6.2
Cross-Sectional Return Results

VARIABLES	Expectations	(1) FULL RET	(2) FV RET	(3) HC RET
CON		0.105**	-0.011	0.085
		(2.071)	(-0.124)	(1.063)
NI	+	-0.012	0.143	-0.673**
		(-0.059)	(0.657)	(-2.400)
CHG_NI	+	0.115	0.114	0.329
		(1.380)	(1.004)	(1.231)
CON*NI	+	**0.582****	**0.558****	**1.104*****
		(2.474)	(2.067)	(3.544)
INTERCEPT		-0.262**	0.304***	-0.036
		(-2.593)	(4.966)	(-0.408)
Observations		932	407	525
R-squared		0.235	0.288	0.282
Country FE		Y	Y	Y
Year FE		Y	Y	Y

Table 6.3
Cross-Sectional Operating Cash Flows Results

		(1)	(2)	(3)
		FULL	FV	HC
VARIABLES	Expectations	FUT CF	FUT CF	FUT CF
CON		-0.001	0.003	0.002
		(-0.166)	(0.270)	(0.186)
CF	+	0.359***	0.503***	0.232***
		(6.130)	(6.015)	(3.001)
NI	+	0.184***	0.139***	0.252**
		(3.559)	(2.674)	(2.176)
CON*NI	+	**0.143*** **	**0.117***	0.110
		(2.613)	(1.428)	(0.980)
INTERCEPT		0.142***	0.096***	0.121***
		(4.795)	(7.029)	(5.056)
Observations		1,348	559	789
R-squared		0.366	0.500	0.305
Country FE		Y	Y	Y
Year FE		Y	Y	Y

Table 6.4
Cross-Sectional Sum of Future Operating Cash Flows Results

VARIABLES	Expectations	(1) FULL SUM FUT CF	(2) FV SUM FUT CF	(3) HC SUM FUT CF
CON		-0.012	-0.001	-0.002
		(-0.657)	(-0.019)	(-0.080)
CF	+	1.111***	1.259***	0.964***
		(7.269)	(4.592)	(5.316)
NI	+	0.559***	0.573**	0.465
		(3.264)	(2.510)	(1.465)
CON*NI	+	0.153	0.074	0.248
		(0.764)	(0.226)	(0.703)
INTERCEPT		0.203***	0.151***	0.190***
		(4.454)	(2.835)	(3.663)
Observations		1,182	453	729
R-squared		0.453	0.583	0.384
Country FE		Y	Y	Y
Year FE		Y	Y	Y

Table 6.5
Cross-Sectional Operating Income Results

VARIABLES	Expectations	(1) FULL FUT OP	(2) FV FUT OP	(3) HC FUT OP
CON		-0.008	-0.016	0.017
		(-1.344)	(-1.107)	(1.371)
OP_INC	+	0.541***	0.556***	0.470***
		(8.652)	(6.346)	(4.083)
LAG_OP_INC	+	0.149***	0.107	0.172**
		(2.605)	(1.454)	(2.278)
CON*OP_INC	+	**0.141****	**0.179***	**0.159***
		(1.929)	(1.344)	(1.355)
INTERCEPT		-0.026	0.082***	-0.062
		(-0.343)	(5.382)	(-0.645)
Observations		1,348	559	789
R-squared		0.496	0.527	0.510
Country FE		Y	Y	Y
Year FE		Y	Y	Y

Table 6.6
Switcher Sample Price Results

		(1)
VARIABLES	Expectations	PRICE
CHG_CON		-0.214
		(-0.852)
POST		1.146***
		(3.603)
BVPS	+	1.275***
		(8.246)
EPS	+	1.190***
		(3.500)
CHG_CON *BVPS	-	**-0.298***
		(-1.621)
POST*BVPS	-	**-0.463*****
		(-3.200)
CHG_CON *POST*BVPS	+	**0.515*****
		(3.485)
INTERCEPT		-2.122
		(-1.278)
Observations		523
R-squared		0.884
Country FE		Y
Year FE		Y

Table 6.7
Switcher Sample Return Results

		(1)
VARIABLES	Expectations	RET
CHG_CON		-0.133
		(-1.584)
POST		-0.171
		(-1.547)
NI	+	0.530
		(1.178)
CHG_NI	+	0.157
		(1.275)
CHG_CON*NI	-	-0.226
		(-0.383)
POST*NI	-	-0.144
		(-0.276)
CHG_CON *POST*NI	+	0.443
		(0.666)
INTERCEPT		-0.211**
		(-2.141)
Observations		523
R-squared		0.249
Country FE		Y
Year FE		Y

Table 6.8
Switcher Sample Operating Cash Flows Results

		(1)
VARIABLES	Expectations	FUT CFO
CHG_CON		-0.005
		(-0.432)
POST		0.025**
		(2.490)
CFO	+	0.372***
		(4.654)
NI	+	0.211**
		(2.172)
CHG_CON*NI	-	-0.038
		(-0.230)
POST*NI	-	0.079
		(0.768)
CHG_CON*POST*NI	+	0.080
		(0.461)
INTERCEPT		0.017
		(0.335)
Observations		782
R-squared		0.413
Country FE		Y
Year FE		Y

Table 6.9
Switcher Sample Sum of Future Operating Cash Flows Results

		(1)
VARIABLES	Expectations	SUM FUT CFO
CHG_CON		-0.008
		(-0.240)
POST		0.071**
		(2.104)
CFO	+	1.221***
		(6.285)
NI	+	0.481*
		(1.754)
CHG_CON *NI	-	0.104
		(0.248)
POST*NI	-	0.424
		(1.153)
CHG_CON*POST*NI	+	-0.428
		(-0.836)
INTERCEPT		0.279***
		(5.833)
Observations		681
R-squared		0.504
Country FE		Y
Year FE		Y

Table 6.10
Switcher Sample Operating Income Results

		(1)
VARIABLES	Expectations	FUT OP
CHG_CON		-0.026**
		(-2.128)
POST		0.028**
		(2.621)
OP_INC	+	0.474***
		(4.292)
LAG_OP_INC	+	0.140*
		(1.799)
CHG_CON*OP_INC	-	0.002
		(0.014)
POST*OP_INC	-	0.148
		(1.114)
CHG_CON *POST*OP_INC	+	0.051
		(0.270)
INTERCEPT		0.064***
		(3.104)
Observations		782
R-squared		0.492
Country FE		Y
Year FE		Y

CHAPTER 7

ADDITIONAL ANALYSES

7.1 Reliability Test

Fair value advocates argue that as long as fair value can be estimated reliably enough, with a Level 1 estimate as defined by the fair value hierarchy established under SFAS 157, then it will provide investors with value relevant information (e.g. Barth and Landsman 1995; Dietrich et al. 2000; Barth et al. 2001; Landsman 2007). Instead, I argue that when measurement is linked to asset use, it will provide investors with value relevant information. Specifically, I argue that historical cost applied to in-use (in-exchange) assets and fair value applied to in-exchange (in-use) assets provides investors with more (less) value relevant information.

To ensure my results are not driven by systematic differences in the reliability of fair value measurements between in-exchange and in-use assets, however, I investigate the role of reliability in my fair value findings. For example, it is possible that I find fair value as less relevant for in-use assets than in-exchange biological assets because the in-use assets are measured with a less reliable fair value estimate than the in-exchange assets.

Table 7.1 provides descriptive statistics for the reliability of the fair value estimates employed for in-exchange and in-use assets: Level 1, Level 2, and Level 3. I include observations for which the reliability of the fair value estimate was disclosed in the IAS 41 footnote. This provides a sample of 533 firm-year observations, of which 209 observations are in-exchange assets and 324 observations are in-use assets. Table 7.1 shows that, indeed, the majority of in-use assets, 81%, are measured with a Level 3 estimate of fair value, while only 10% are measured with a Level 2 fair value estimate, and 8% are measured with a Level 1 estimate. On the other hand, Table 7.1 shows that 44% of in-exchange assets are measured using a Level 1 estimate of fair value, while 16% are measured with a Level 2 estimate of fair value, and 41% are measured with a Level 3 estimate of fair value. Table 7.1 highlights the fact that although the majority of in-use assets are measured using a Level 3 estimate, 44% of the in-exchange biological assets are also measured using a Level 3 estimate.

Because of the variation in reliability across the two samples (see Table 7.1), I address the concern that reliability may be influencing my results in two ways. First, I re-estimate the cross-sectional regressions and include a dummy variable that takes a value of one if the firm employs a Level 2 or Level 3 input to estimate the fair value of its biological assets, and zero otherwise. I intend the dummy variable to capture the effect of firms' use of less reliable fair value estimates. My results are unchanged after controlling for cross-sectional variation via the inclusion of the indicator variable.

The second way I address reliability is to re-estimate the cross-sectional tests on the fair value sample, by reliability level: Level 1, Level 2, and Level 3. This is a stringent test since partitioning the sample in this manner significantly limits the size of the three subsamples. Consequently, I find little statistical significance in the main coefficients or the interaction terms for the consistent sample. This is likely a power issue since the sample size is substantially reduced when I estimate each regression by level of reliability. I plan on addressing this issue in future work when I hand-collect the remaining fiscal year disclosures, discussed further in the next chapter.

7.2 Robustness Tests

I conduct several robustness tests to assess the stability of my results. First, I re-estimate all regressions employing a robust regression estimation technique. Robust regression is an alternative to least squares regression when there is a possibility that outliers or influential observations may be driving the results. To ensure that my results are not driven by outliers, I re-estimate all regressions employing the robust estimation technique. My results are unchanged.

Next, I explore the effect of IFRS enforcement on my results. It is possible that certain countries are better able to enforce IAS 41 than others because they have the expertise to do so. For example, certain countries may have auditors with better access to valuation resources who in turn provide more reliable estimates of fair value, or better enforce the standard, than auditors in other countries. I control for country fixed effects in my regression analysis, which should address this concern to some extent. Nevertheless, as an alternative to this control, I include an index of country-level audit enforcement developed in Brown et al. (2014). Brown et al. (2014) develop an audit enforcement index where countries receive higher scores if auditors have greater incentives to provide a high-quality audit and make a greater effort to promote compliance with accounting standards. Using the Brown et al. (2014) index, which is available for 24 of the countries in my sample, I re-estimate all my regressions by including fixed effects for the enforcement index, instead of country fixed effects, in order to examine whether differences in audit enforcement are driving my results. The results remain unchanged.

In my primary price regression, I interact the consistent variable with BVPS but not EPS because I am interested in the difference between the value relevance of book value for the consistent and inconsistent samples. I examine the value relevance of firm income in the return regression and in the mechanical forecasting models. To examine the sensitivity of my results to this research design choice, I include an interaction of the consistent variable with EPS in my price regressions, in addition to the interaction with BVPS. I find that for the fair value sample, BVPS is significantly more value relevant, while EPS is significantly less value relevant for the consistent sample. This finding is consistent with investors placing more weight on the firm's balance sheet than the firm's earnings when a fair value model is employed (see Nissim and Penman 2008). Consistent with this argument, I find that both BVPS and EPS are significantly more value relevant for the consistent sample that measures their biological assets at historical cost. As Nissim and Penman (2008) argue, investors rely more heavily on earnings when a historical cost model is employed relative to a fair value model.

For the cross-sectional tests, I re-estimate all fair value models and restrict the sample to fiscal years in 2005 and later to explore the effects of early IFRS adopters on my results. My results are unchanged and, in fact, they are even more statistically significant.

In addition, I estimate the cross-sectional price models by examining the value relevance of the biological assets, separated out from BVPS. I find that the fair value of the biological assets for the consistent sample is not incrementally more value relevant relative to the inconsistent sample, which suggests that investors do not price the fair value of in-exchange and in-use assets differently. On the other hand, I find that the book value of the biological assets for the consistent sample is significantly more value relevant relative to the inconsistent sample. This result suggests that investors apply different multiples to in-use and in-exchange biological assets when they are measured at historical cost. Specifically, investors apply a higher multiple to in-use biological assets when they are measured at historical cost relative to in-exchange biological assets, consistent with in-use assets being used in combination with other firm assets to create value for the firm. Therefore, investors apply a higher multiple to in-use assets in order to capture the value the in-use assets create, relative to in-exchange assets.

For the switcher sample tests, I re-estimate all models utilizing different samples. First, I estimate the switcher sample models employing firm-year observations the year prior to IAS 41 adoption, and the year of IAS 41 adoption. I also estimate the switcher sample models employing firm-year observations the year prior to IAS 41 adoption, and the year following IAS 41 adoption, excluding the adopting year. Finally, I estimate the switcher models including all pre-IAS 41 data. The switcher results are unchanged.

Table 7.1
Fair Value Firm-Year Observations by Reliability Level and Value Realization

RELIABILITY	IN-EXCHANGE	IN-USE
LEVEL 1	91	26
	44%	*8%*
LEVEL 2	33	34
	16%	*10%*
LEVEL 3	85	264
	41%	*81%*
TOTAL	**209**	**324**
	100%	**100%**

CHAPTER 8

FUTURE WORK

This study provides empirical evidence in support of early accounting theory, namely that measurement linked to asset use provides investors with more value relevant information. This finding is novel to the extant literature. In particular, I find support for early accounting theory instead of the relative reliability approach adopted by fair value advocates. My findings and the unique setting I employ, the adoption of IAS 41, provide a host of other research questions.

First and foremost, I plan to hand-collect IAS 41 disclosures for fiscal years 2012 and 2013. This will increase the number of observations in my sample.

Second, I plan to investigate whether URGL are more informative for investors when biological assets are measured consistent with their use, relative to when they are not. This will provide new evidence to the extant literature: IAS 41 is one of a few standards that requires fair value measurement of nonfinancial assets and is a “true” fair value standard. Prior research examines the informativeness of URGL recognized in *other comprehensive income*, for fair value standards that require fair value measurement of financial assets. Instead, I will examine the informativeness of URGL recognized in *income* for nonfinancial assets. Moreover, if measurement linked to asset use provides investors with more value relevant information, than I would expect that URGL for assets that derive value in-exchange versus in-use would provide investors with more value relevant information.

Finally, I also hand-collected firms' placement of the URGL related to the change in the fair value of the biological assets. Specifically, some firms disclose the URGL on the face of the income statement, while others disclose the URGL under, "other revenues or expenses." I plan to investigate the pricing of the URGL depending upon the placement on the financial statement. Specifically, this research would provide insight into whether disclosing the URGL on the face of the statements versus the footnotes influences investors use of that information.

CHAPTER 9

CONCLUSION

I empirically examine whether asset measurement linked to asset use provides investors with relatively more value relevant information than when measurement is not linked to asset use. I test early accounting theory, which proposes the asset measurement linked to asset use provides investors with value relevant information. I test this framework on a sample of 182 firms from 33 different countries that adopt IAS 41. IAS 41 prescribes fair value measurement for biological assets, which are living plants and animals.

In a multipronged approach, I assess the value relevance of book value and earnings information in regressions of stock price, stock returns, future operating cash flows, and future operating income for the firms that measure their biological assets consistent with their use, where in-exchange biological assets are measured at fair value and in-use biological assets are measured at historical cost (the consistent measurement sample) and for the firms that measure their biological assets inconsistent with their use, where in-exchange biological assets are measured at historical cost and in-use assets are measured at fair value (the inconsistent measurement sample).

My results are as follows. First, in the cross-sectional tests, I find strong support for my hypothesis, that when measurement is linked to asset use, investors are provided with more value relevant information. As suggested by early accounting theorists, I find that book value and earnings information is more value relevant when asset measurement is consistent with the manner in which the asset realizes value for the firm, relative to when it is not. Specifically, I find that book value and earnings information is more value relevant when in-exchange (in-use) assets are measured at fair value (historical cost) as compared to when in-exchange (in-use) assets are measured at historical cost (fair value).

I supplement my cross-sectional findings by comparing the value relevance of firms' book value and earnings information for firms that switched measurement from historical cost to fair value upon adoption of IAS 41, the "switcher" sample. The results provide mixed evidence. Specifically, I find strong evidence that book value per share became significantly more (less) value relevant for firms that held in-exchange (in-use) biological assets and began measuring them at fair value upon adoption of the standard. However, I find no other significant results in the return tests or the mechanical forecasting models of future operating cash flows and operating income. In future work, I plan to hand-collect the interim fiscal year IAS 41 disclosures in order to increase my sample, and consequently, the power of the switcher test.

Overall, my findings support an asset measurement framework that links asset measurement to asset use, and suggest that a measurement basis that violates the link to asset use provides investors with relatively less value relevant information to assess firm value.

APPENDIX

VARIABLE DEFINITIONS

Variable Name	**Definition/Calculation**
EPS	The variable 'basic_eps_incl' from the Capital IQ database in fiscal year *t*.
BVPS	Book value of equity per share in fiscal year *t*. (Total Assets – Total Liabilities)/Common Shares Outstanding.
CF	Cash flows from operations, scaled by average total assets, in fiscal year *t*.
CHG NI	Change in net income, excluding the URGL, from fiscal year *t* to fiscal year *t-1*, scaled by lagged market value of equity.
FUT CF	Cash flows from operations, scaled by average total assets, in fiscal year *t+1*.
FUT OP	The variable 'earnings from continuing operations' from the Capital IQ database, scaled by average total assets, in fiscal year *t+1*.
LAG OP_INC	The variable 'earnings from continuing operations' from the Capital IQ database, scaled by average total assets, in fiscal year *t-1*.
NI	Net income in fiscal year *t*, scaled by average total assets,.
OP_INC	The variable 'earnings from continuing operations' from the Capital IQ database, scaled by average total assets, in fiscal year *t*.
PRICE	Price is calculated for the month following the annual report filing or, alternatively, four months following the firm's fiscal year end. Data are from *Datastream*.
RET	Cumulated 12-month, raw returns over the fiscal year ending the month following the annual report issuance or alternatively, four months following the firm's fiscal year end. Data are from *Datastream*.
SUM FUT CF	The sum of operating cash flows from fiscal year *t+1, t+2*, and *t+3*, scaled by average total assets.

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